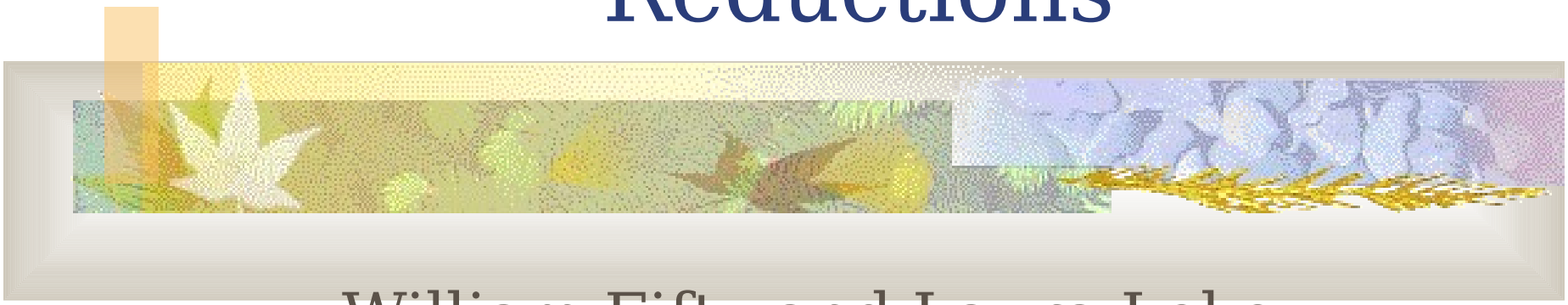
Approaching Water Sustainability through Water/Wastewater Reductions



William Fifty and Laura Lokey-Flippo

USACHPPM - Surface Water and Wastewater Program

Sustaining the Army Mission

- FORSCOM initiative
  - Identify environmental issues that could compromise future mission
  - Develop long range goals in coordination with stakeholders
  - Tie these goals to resources and implement

Ft Lewis Water Sustainability Goals

- By 2025
  - Cascade water use to achieve zero discharge of wastewater
  - Reduce potable water consumption by 75%
  - Contribute no pollutants to groundwater and remediate all contaminated groundwater
- By 2012, develop effective regional aquifer and watershed management program

Reducing Wastewater Discharges

- Conservation
- Reclamation and Reuse
- Augmentation

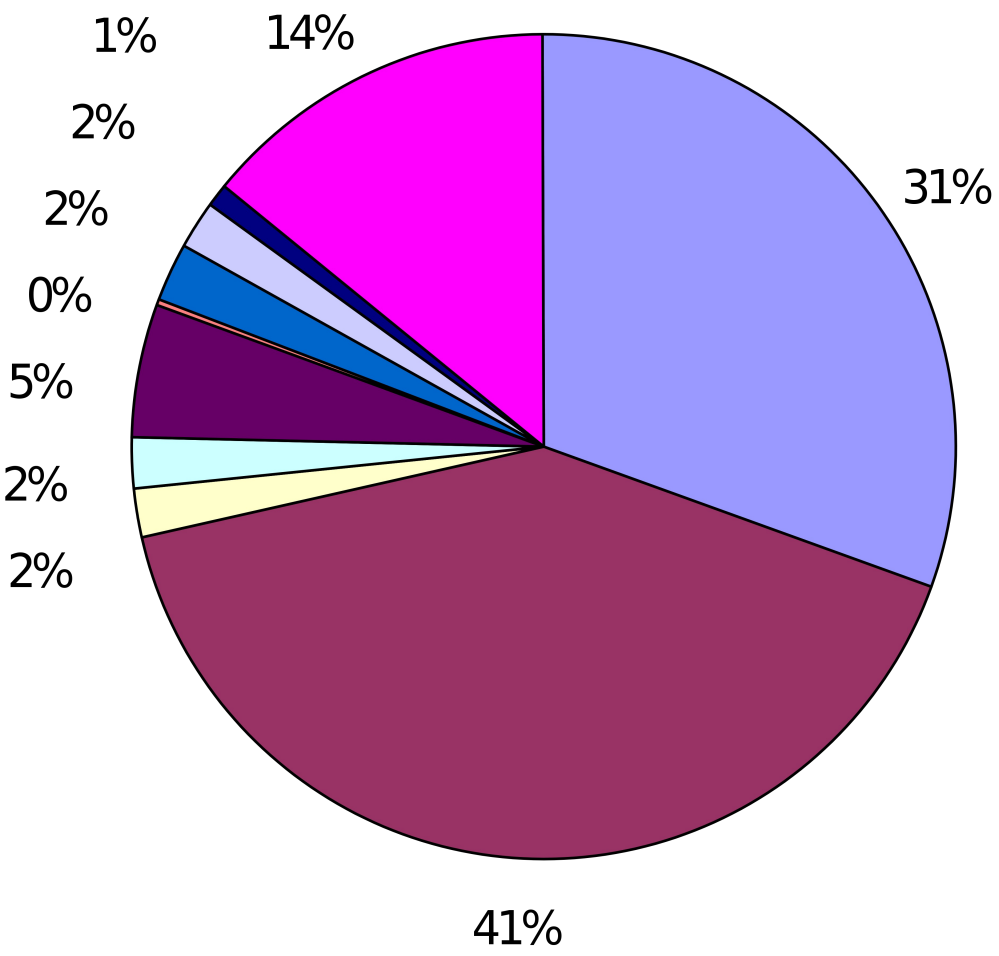
Conservation

EO 13123, Greening the Government Through Efficient Energy Management

Water Conservation Goals

- Water Management Plan
- 4 (or more) water efficiency BMPs
- ACSIM (Army) Deadline
  - Water Management Plan – Oct 04
  - Implemented BMPs - 2010:

APG Potable Water Usage



Federal Energy Management Program BMPs

- Includes
  - Operations and Maintenance Options
  - Retrofit and Replacement Options
    - < 10 year pay back
- 1 - Public Information and Education Programs
  - 10-15% annual savings in water usage

BMPs - continued

- 2 - Distribution System Audits, Leak Detection, and
  - Audit losses > 20%

- 3 - Water Efficient Landscaping
  - Promising if water usage > 10%

BMPs - continued

- 4 - Toilets and Urinals
  - Fix leaking toilets
  - Replacement of old to
- Flushing Standards
  - < 1994, 4-7 gpf
  - currently 1.6 gpf

BMPs - continued

- 5 - Faucets and Showerheads
  - Current standard 2.5 gpm
- Other opportunities for residential water
  - Dishwashers
  - Clothes washers

BMPs - continued

- 6 - Boiler and Steam Systems
- 7 - Single Pass Cooling Equipment
- 8 - Cooling Tower Management
- 9 - Miscellaneous High Water Using Processes
- 10 - Water Reuse and Recycling

Reclamation and Reuse

Source Substitution

Reuse Regulations

- No Federal regulations or standards for water reclamation and reuse
  - “Guidelines for Water Reuse” - 1992
- Within the US, state agencies are responsible for water reuse standards

Requirements for Non-potable Reuse

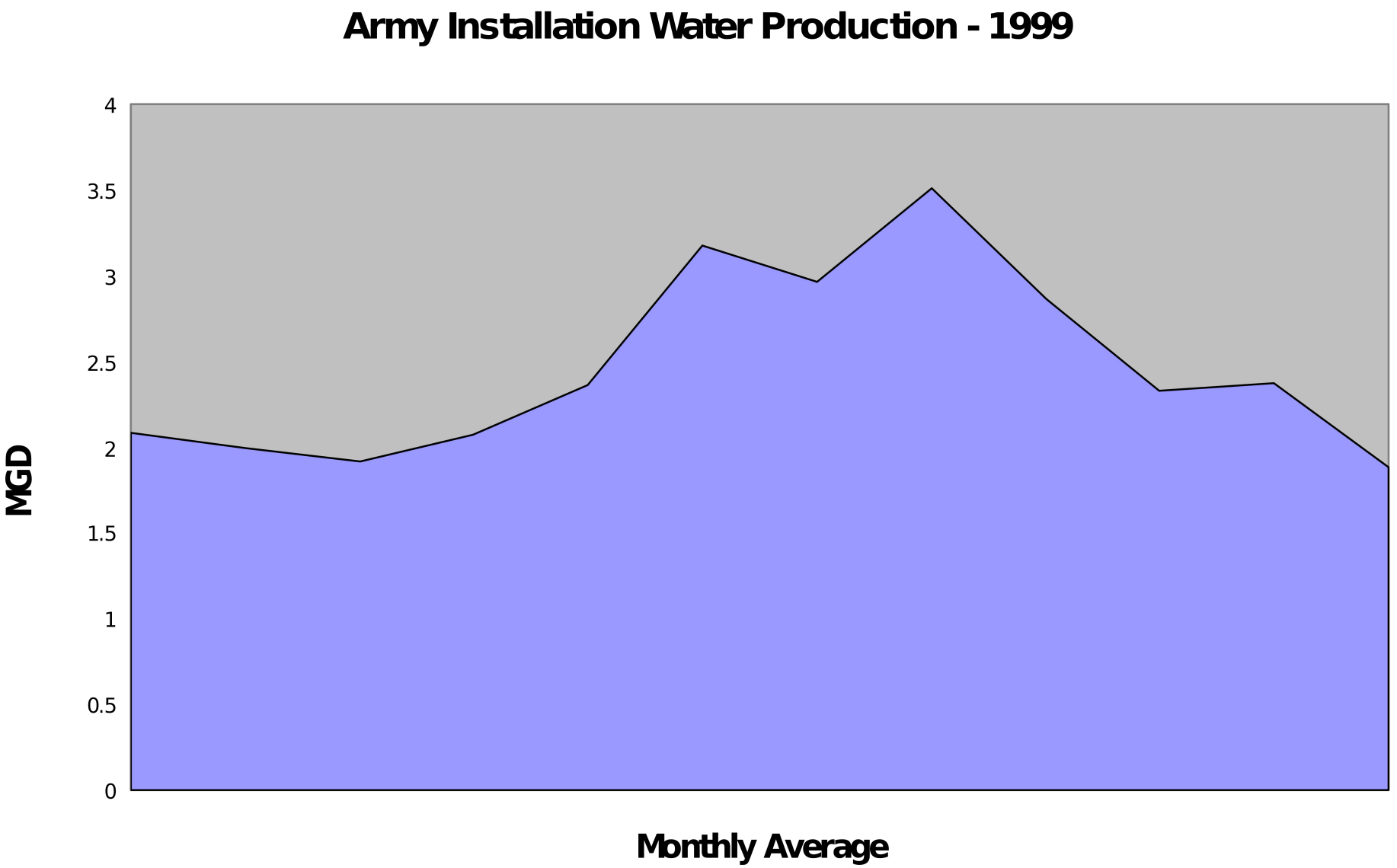
- Conventional water and wastewater treatment technology
- Match between water quality and intended use
- Protection of human health
- Public acceptance where it is being introduced

Reclaimed Water Match grade, treatment, designated use

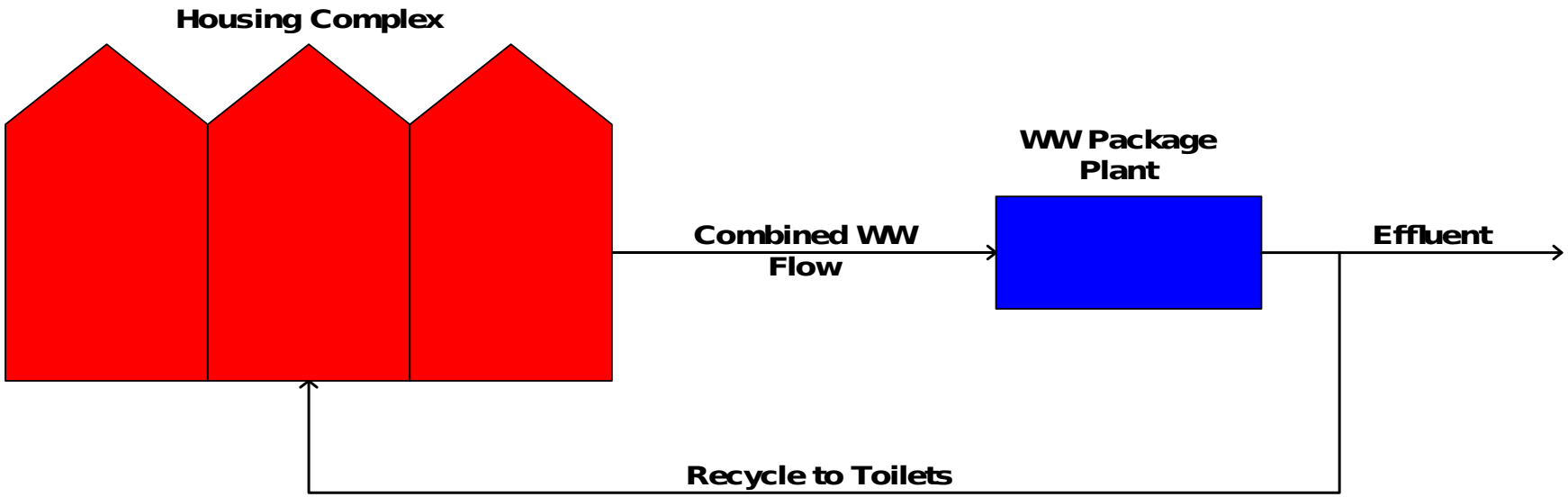
grade 1	grade 2	grade 3	grade 4	grade 5
secondary, filtration, disinfection	grade 1, plus NH3 removal	secondary, ultra-filtration, RO	grade 3 plus lime softening	double RO
landscape irrigation	cooling towers	low pressure boiler feed	potable water aug-mentation	high pressure boiler feed

Landscape Irrigation

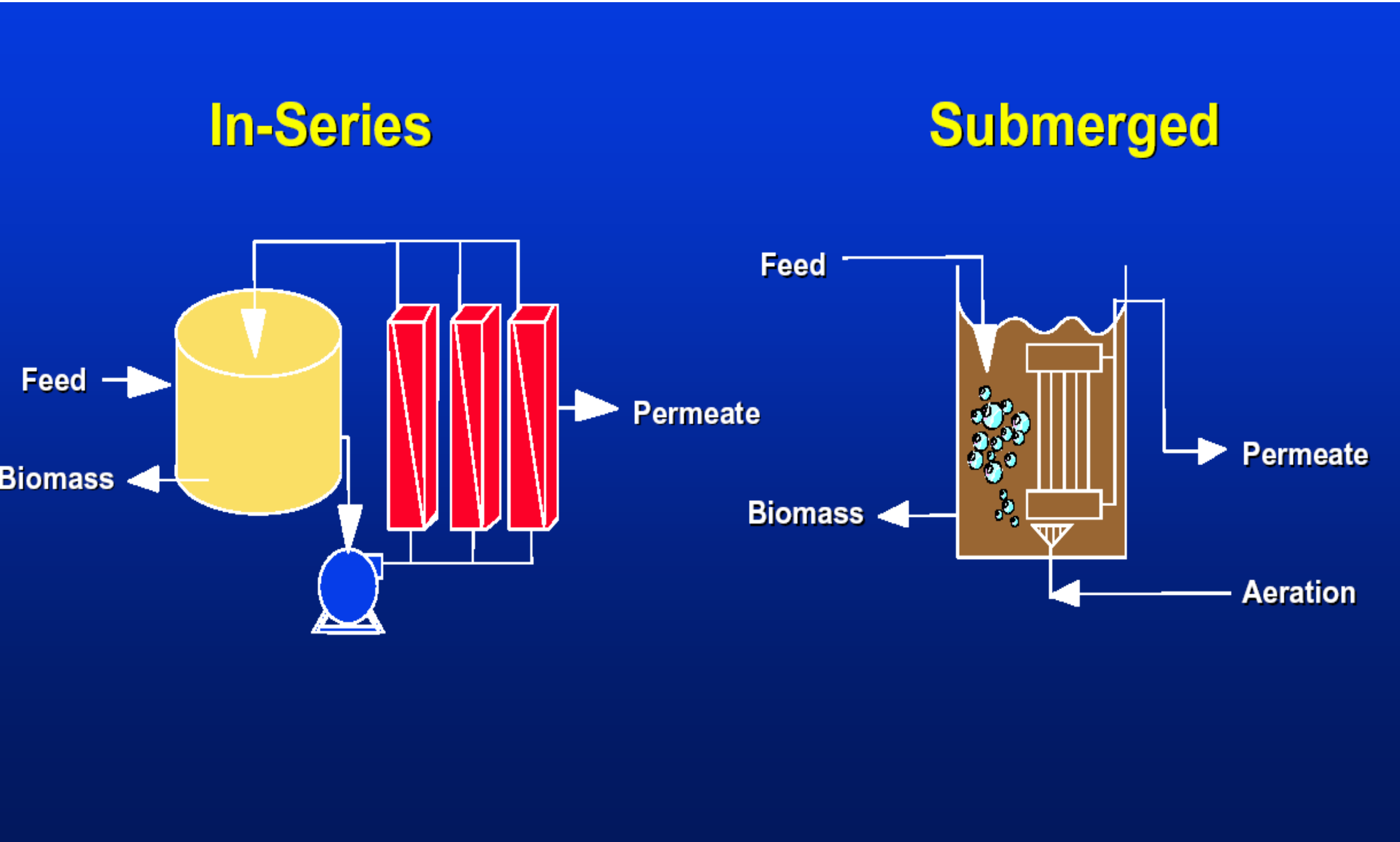
- Parade fields
- Recreation fields
- Landscaped areas
- Golf courses (w/ water hazards)
- ----------
- Single family/multifamily residences


Army Installation Water Production - 1999
4
3.5
3
2.5
2
1.5
1
0.5
0
MGD
Monthly Average

Toilet Flushing



Membrane Bioreactor Configurations



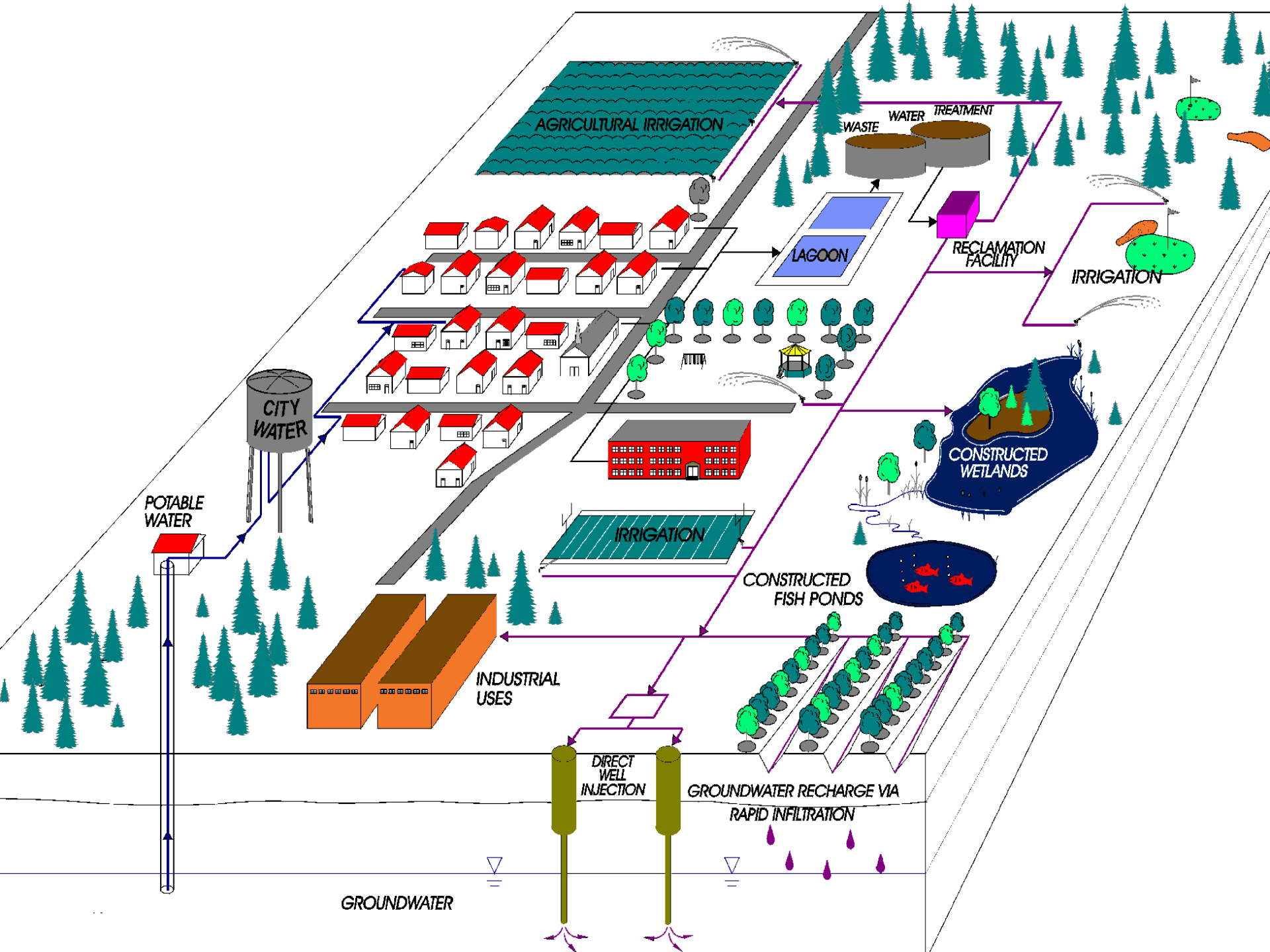
Vehicle Washing

Industrial Applications

- Central Energy Plant
  - Cooling tower make up
  - Wet scrubbers
  - Boiler make up water

Other Opportunities

- Dust control
- Sale for agricultural uses
- Man-made Wetlands


AGRICULTURAL IRRIGATION
WASTE WATER TREATMENT
LAGOON
RECLAMATION FACILITY
IRRIGATION
CITY WATER
POTABLE WATER
CONSTRUCTED WETLANDS
IRRIGATION
CONSTRUCTED FISH PONDS
INDUSTRIAL USES
DIRECT WELL INJECTION
GROUNDWATER RECHARGE VIA RAPID INFILTRATION
GROUNDWATER

Augmentation of Potable Water Supplies

Groundwater Recharge

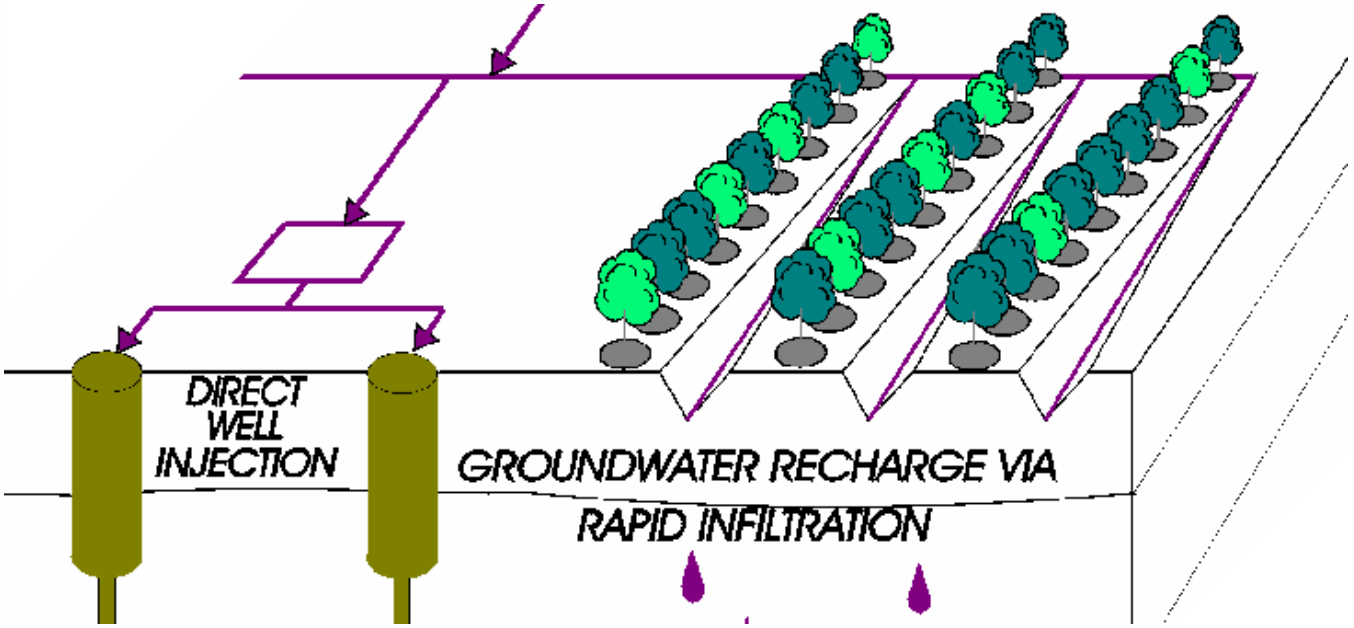
Stream Augmentation

Groundwater Recharge

- Intent is to replenish groundwater
- Applications
  - Augmentation of potable water supplies
  - Storage for reclaimed water
    - Aquifer storage and recovery (ASR)
  - Establish salt-water intrusion barriers in coastal areas

Recharge Mechanisms

- Surface spreading
- Direct injection



Stream Augmentation

- Seeks to replenish a surface water
- Applications
  - Augments a potable water supply
  - Maintains stream flow for fish, wildlife, and aesthetics
- Example
  - Occoquan Reservoir, Virginia

Summary

- Opportunities are available for water conservation and wastewater reuse
- Past efforts were limited.
- Now we see a more programmatic view towards water conservation and installation sustainment